Nuclear waste could be recycled for diamond battery power

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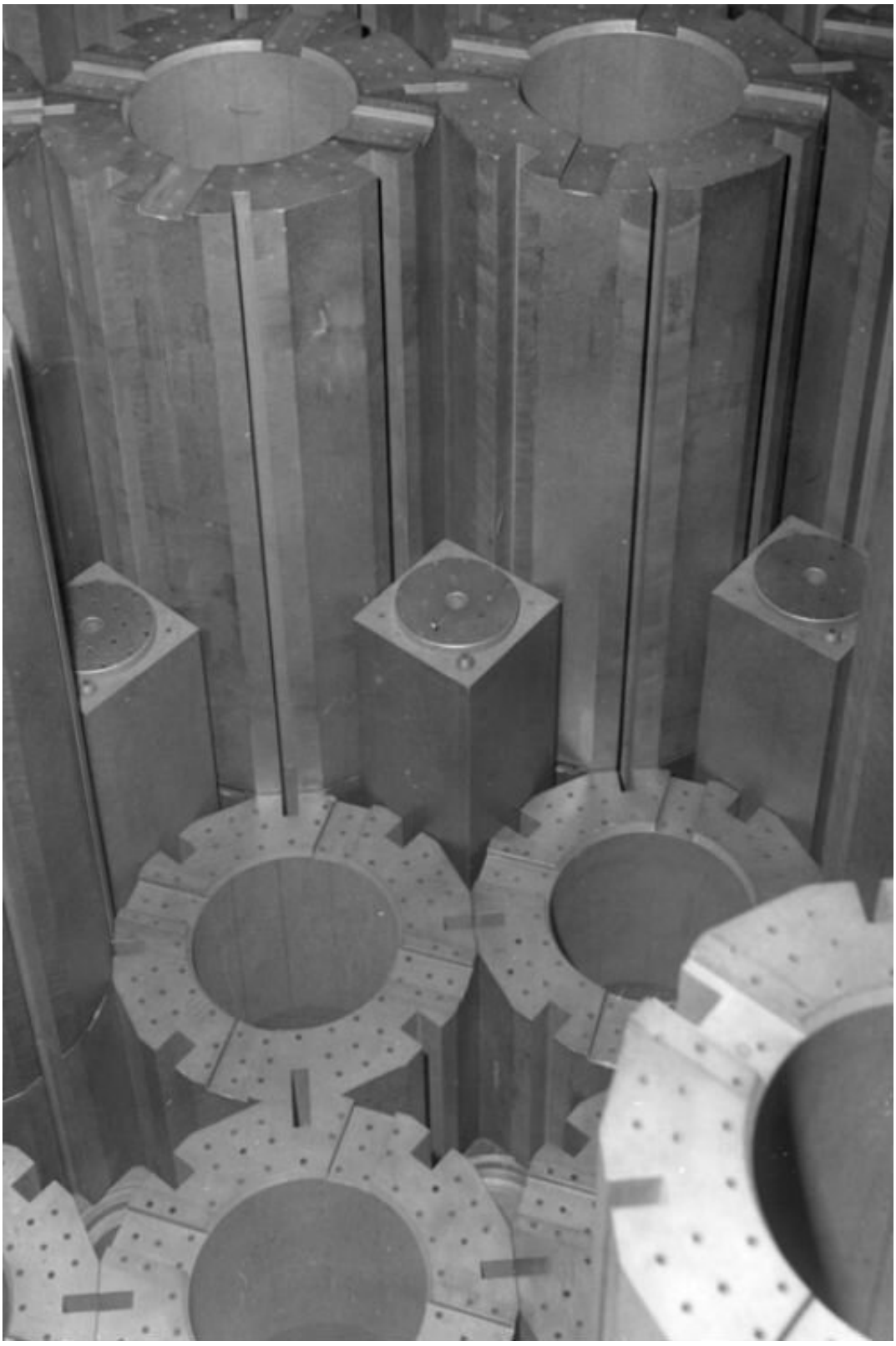

The structure of Graphite blocks in a nuclear reactor. Credit: EDF Energy

A team of physicists and chemists from the University of Bristol hope to recycle radioactive material directly from a former nuclear power plant in Gloucestershire to generate ultra-long-lasting power sources.

Work has begun at Berkeley Power Station in to remove radioactive waste products from the site as part of its decommissioning program.

By extracting carbon-14 isotopes from the irradiated graphite, the time and cost of the clean-up operation would be significantly reduced.

Berkeley was decommissioned in 1989 and it has only just become safe to start removing radioactive waste products from the plant.

These are currently stored in concrete vaults eight meters underground and require specialist equipment to retrieve and process securely.

The second nuclear station on the bank of the River Severn is Oldbury, which stopped producing electricity in 2012. This site completed defueling in 2016 and is now in the early decommissioning phase.

These two sites, as well as the reactors at Hinkley Point in Somerset and other decommissioned sites across the UK, hold vast amounts of irradiated graphite that hold the carbon-14 isotope that could be recycled to generate power.

University of Bristol researchers have grown a man-made diamond that, when placed in a radioactive field, is able to generate a small electrical current. By using carbon-14 which has a half-life of 5730 years, the batteries could potentially provide power on a near-infinite basis.

This work is part of the ASPIRE project: Advanced Self-Powered sensor units in Intense Radiation Environments. The lead researcher is Professor Tom Scott from the School of Physics and Director of the

South West Nuclear Hub.

He said: "Over the past few years we have been developing ultra-low powered sensors that harvest energy from radioactive decay. This project is at quite an advanced stage now and we have tested the batteries in sensors in places as extreme as the top of a volcano!"

As well as using the batteries in environments where conventional power sources cannot easily be replaced, there are potential applications for medical purposes such as for hearing aids or pacemakers. It could even be possible to power spacecraft or satellites for much further travel than is currently possible.

Professor Scott added: "The ultimate aim is to have a factory based at one of the former power stations in the South West that takes carbon-14 isotopes directly from the graphite blocks for use in diamond batteries.

"This would significantly reduce the radioactivity of the remaining material, making it easier and safer to manage.

"With the majority of the UK's nuclear power plants set to go offline in the next 10-15 years this presents a huge opportunity to recycle a large amount of material to generate power for so many great uses."

This technology is a strong example of the research and innovation being developed in the South West region, the home to the only nuclear new build project in the UK.

Provided by University of Bristol

https://techxplore.com/news/2020-01-nuclear-recycled-diamond-battery-power.html